FIG.1

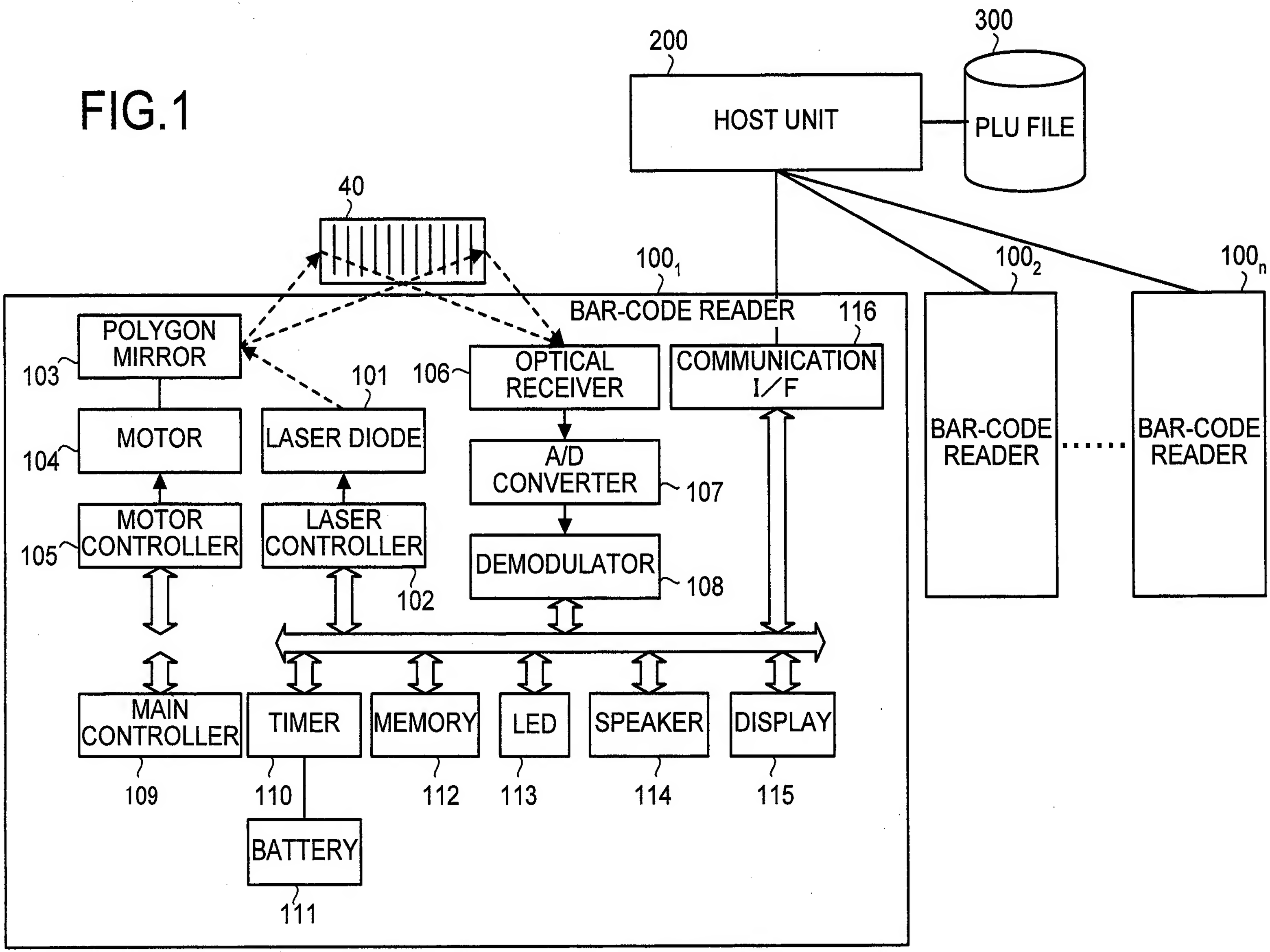
200
HOST UNIT
300
PLU FILE
40
100₁
100₂
100ₙ
BAR-CODE READER
116
COMMUNICATION I/F
POLYGON MIRROR
103
101
106
OPTICAL RECEIVER
MOTOR
104
LASER DIODE
A/D CONVERTER
107
MOTOR CONTROLLER
105
LASER CONTROLLER
102
DEMODULATOR
108
MAIN CONTROLLER
109
TIMER
110
MEMORY
112
LED
113
SPEAKER
114
DISPLAY
115
BATTERY
111
BAR-CODE READER
BAR-CODE READER

FIG.2

400A

		DEDEMODULATION PATTERN TABLE FOR SEVEN MODULES						
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
ODD	0	W	W	W	B	B	W	B
	1	W	W	B	B	W	W	B
	2	W	W	B	W	W	B	B
	3	W	B	B	B	B	W	B
	4	W	B	W	W	W	B	B
	5	W	B	B	W	W	W	B
	6	W	B	W	B	B	B	B
	7	W	B	B	B	W	B	B
	8	W	B	B	W	B	B	B
	9	W	W	W	B	W	B	B
EVEN	0	W	B	W	W	B	B	B
	1	W	B	B	W	W	B	B
	2	W	W	B	B	W	B	B
	3	W	B	W	W	W	W	B
	4	W	W	B	B	B	W	B
	5	W	B	B	B	W	W	B
	6	W	W	W	W	B	W	B
	7	W	W	B	W	W	W	B
	8	W	W	W	B	W	W	B
	9	W	W	B	W	B	B	B

410A

		DEDEMODULATION PATTERN TABLE FOR SIX MODULES					
		(1)	(2)	(3)	(4)	(5)	(6)
ODD	0	W	W	B	B	W	B
	1	DEDEMODULATION IS IMPOSSIBLE (NO PATTERN)					
	2	DEDEMODULATION IS IMPOSSIBLE (NO PATTERN)					
	3	DEDEMODULATION IS IMPOSSIBLE (NO PATTERN)					
	4	W	B	W	W	B	B
	5	W	B	W	W	W	B
	6	W	B	B	B	B	B
	7	DEDEMODULATION IS IMPOSSIBLE (NO PATTERN)					
	8	DEDEMODULATION IS IMPOSSIBLE (NO PATTERN)					
	9	W	W	B	W	B	B
EVEN	0	W	B	W	B	B	B
	1	DEDEMODULATION IS IMPOSSIBLE (NO PATTERN)					
	2	DEDEMODULATION IS IMPOSSIBLE (NO PATTERN)					
	3	DEDEMODULATION IS IMPOSSIBLE (NO PATTERN)					
	4	W	W	B	B	W	B
	5	W	B	B	W	W	B
	6	W	W	W	B	W	B
	3	DEDEMODULATION IS IMPOSSIBLE (NO PATTERN)					
	3	DEDEMODULATION IS IMPOSSIBLE (NO PATTERN)					
	9	W	W	W	B	B	B

420A

		DEDEMODULATION PATTERN TABLE FOR EIGHT MODULES							
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ODD	0	W	W	W	W	B	B	W	B
	1	W	W	W	B	B	W	W	B
	2	W	W	W	B	W	W	B	B
	3	W	W	B	B	B	B	W	B
	4	W	W	B	W	W	W	B	B
	5	W	W	B	B	W	W	W	B
	6	W	W	B	W	B	B	B	B
	7	W	W	B	B	B	W	B	B
	8	W	W	B	B	W	B	B	B
	9	W	W	W	W	B	W	B	B
EVEN	0	W	W	B	W	W	B	B	B
	1	W	W	B	B	W	W	B	B
	2	W	W	W	B	B	W	B	B
	3	W	W	B	W	W	W	W	B
	4	W	W	W	B	B	B	W	B
	5	W	W	B	B	B	W	W	B
	6	W	W	W	W	W	B	W	B
	7	W	W	W	B	W	W	W	B
	8	W	W	W	W	B	W	W	B
	9	W	W	W	B	W	B	B	B

FIG.3

400B

	DEDEMODULATION PATTERN TABLE FOR SEVEN MODULES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ODD	0	B	W	B	B	W	W	W
	1	B	W	W	B	B	W	W
	2	B	B	W	W	B	W	W
	3	B	W	B	B	B	B	W
	4	B	B	W	W	W	B	W
	5	B	W	W	W	B	B	W
	6	B	B	B	B	W	B	W
	7	B	B	W	B	B	B	W
	8	B	B	B	W	B	B	W
	9	B	B	W	B	W	W	W
EVEN	0	B	B	B	W	W	B	W
	1	B	B	W	W	B	B	W
	2	B	B	W	B	B	W	W
	3	B	W	W	W	W	B	W
	4	B	W	B	B	B	W	W
	5	B	W	W	B	B	B	W
	6	B	W	B	W	W	W	W
	7	B	W	W	W	B	W	W
	8	B	W	W	B	W	W	W
	9	B	B	B	W	B	W	W

410B

	DEDEMODULATION PATTERN TABLE FOR SIX MODULES	(1)	(2)	(3)	(4)	(5)	(6)
ODD	0	B	W	B	B	W	W
	1	DEDEMODULATION IS IMPOSSIBLE (NO PATTERN)					
	2	DEDEMODULATION IS IMPOSSIBLE (NO PATTERN)					
	3	DEDEMODULATION IS IMPOSSIBLE (NO PATTERN)					
	4	B	B	W	W	B	W
	5	B	W	W	W	B	W
	6	B	B	B	B	B	W
	7	DEDEMODULATION IS IMPOSSIBLE (NO PATTERN)					
	8	DEDEMODULATION IS IMPOSSIBLE (NO PATTERN)					
	9	B	B	W	B	W	W
EVEN	0	B	B	B	W	B	W
	1	DEDEMODULATION IS IMPOSSIBLE (NO PATTERN)					
	2	DEDEMODULATION IS IMPOSSIBLE (NO PATTERN)					
	3	DEDEMODULATION IS IMPOSSIBLE (NO PATTERN)					
	4	B	W	B	B	W	W
	5	B	W	W	B	B	W
	6	B	W	B	W	W	W
	7	DEDEMODULATION IS IMPOSSIBLE (NO PATTERN)					
	8	DEDEMODULATION IS IMPOSSIBLE (NO PATTERN)					
	9	B	B	B	W	W	W

420B

	DEDEMODULATION PATTERN TABLE FOR EIGHT MODULES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ODD	0	B	W	B	B	W	W	W	W
	1	B	W	W	B	B	W	W	W
	2	B	B	W	W	B	W	W	W
	3	B	W	B	B	B	B	W	W
	4	B	B	W	W	W	B	W	W
	5	B	W	W	W	B	B	W	W
	6	B	B	B	B	W	B	W	W
	7	B	B	W	B	B	B	W	W
	8	B	B	B	W	B	B	W	W
	9	B	B	W	B	W	W	W	W
EVEN	0	B	B	B	W	W	B	W	W
	1	B	B	W	W	B	B	W	W
	2	B	B	W	B	B	W	W	W
	3	B	W	W	W	W	B	W	W
	4	B	W	B	B	B	W	W	W
	5	B	W	W	B	B	B	W	W
	6	B	W	B	W	W	W	W	W
	7	B	W	W	W	B	W	W	W
	8	B	W	W	B	W	W	W	W
	9	B	B	B	W	B	W	W	W

FIG.4A

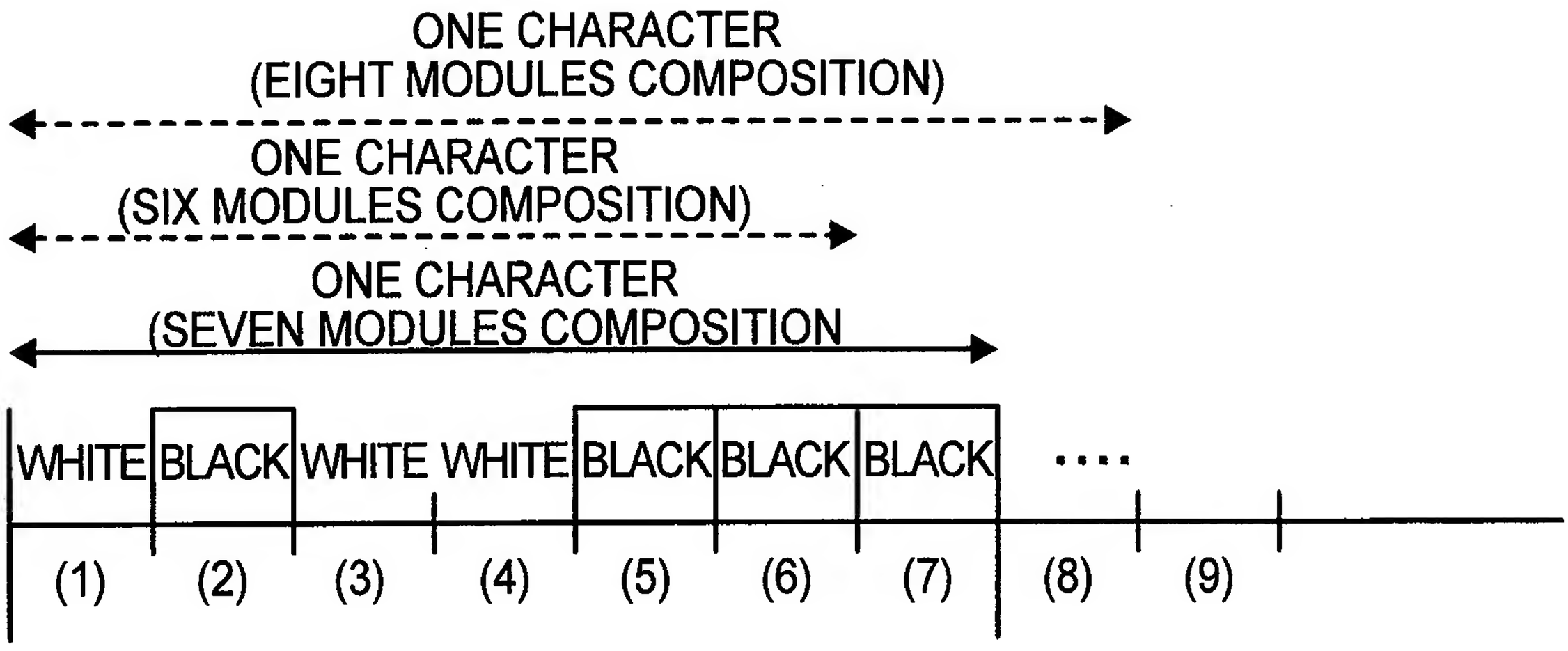
ONE CHARACTER
(EIGHT MODULES COMPOSITION)
ONE CHARACTER
(SIX MODULES COMPOSITION)
ONE CHARACTER
(SEVEN MODULES COMPOSITION
WHITE
BLACK
WHITE
WHITE
BLACK
BLACK
BLACK
....
(1)
(2)
(3)
(4)
(5)
(6)
(7)
(8)
(9)

FIG.4B

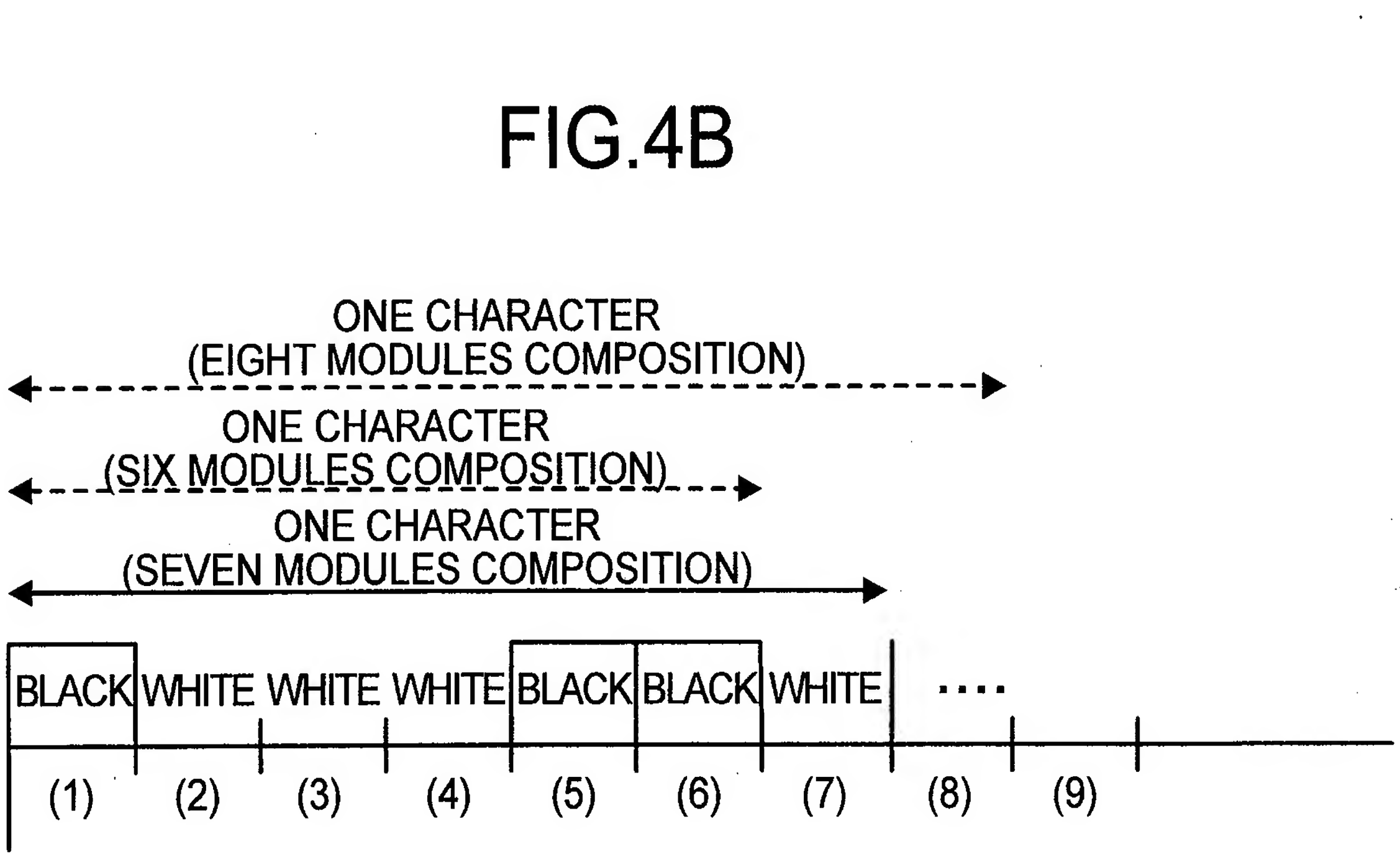
ONE CHARACTER
(EIGHT MODULES COMPOSITION)
ONE CHARACTER
(SIX MODULES COMPOSITION)
ONE CHARACTER
(SEVEN MODULES COMPOSITION)
BLACK
WHITE
WHITE
WHITE
BLACK
BLACK
WHITE
....
(1)
(2)
(3)
(4)
(5)
(6)
(7)
(8)
(9)

FIG.5A

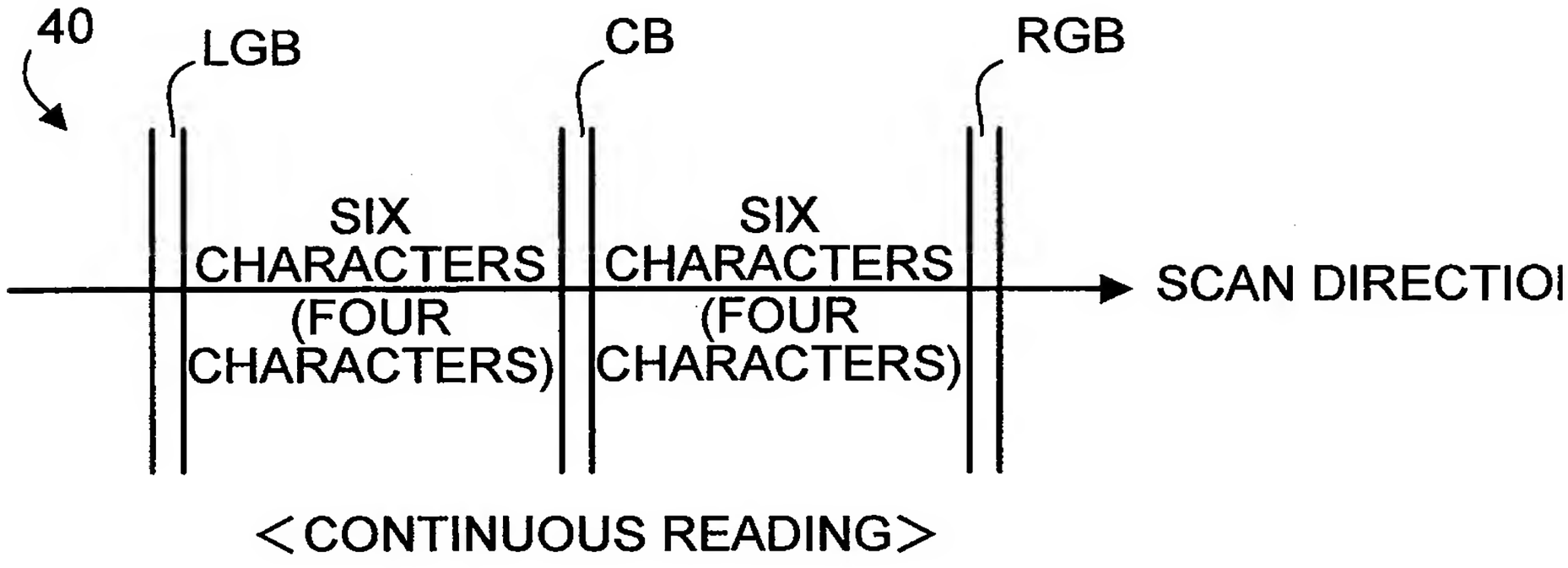

FIG.5B

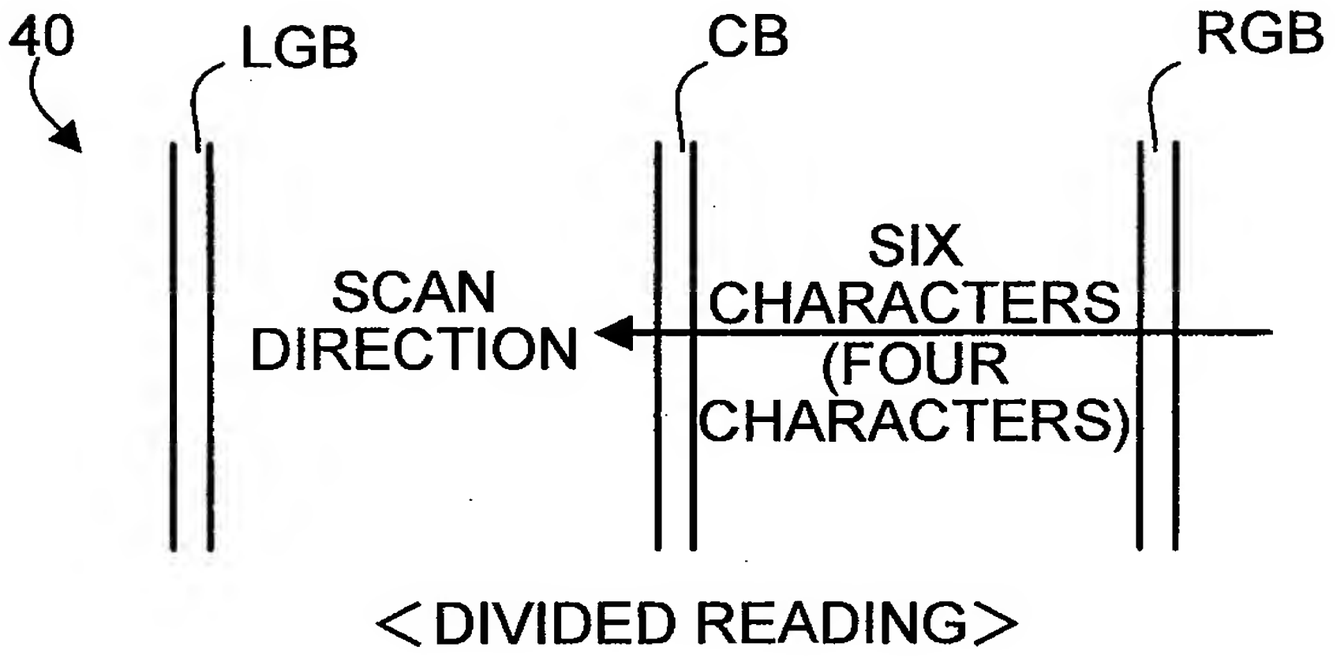

FIG.5C

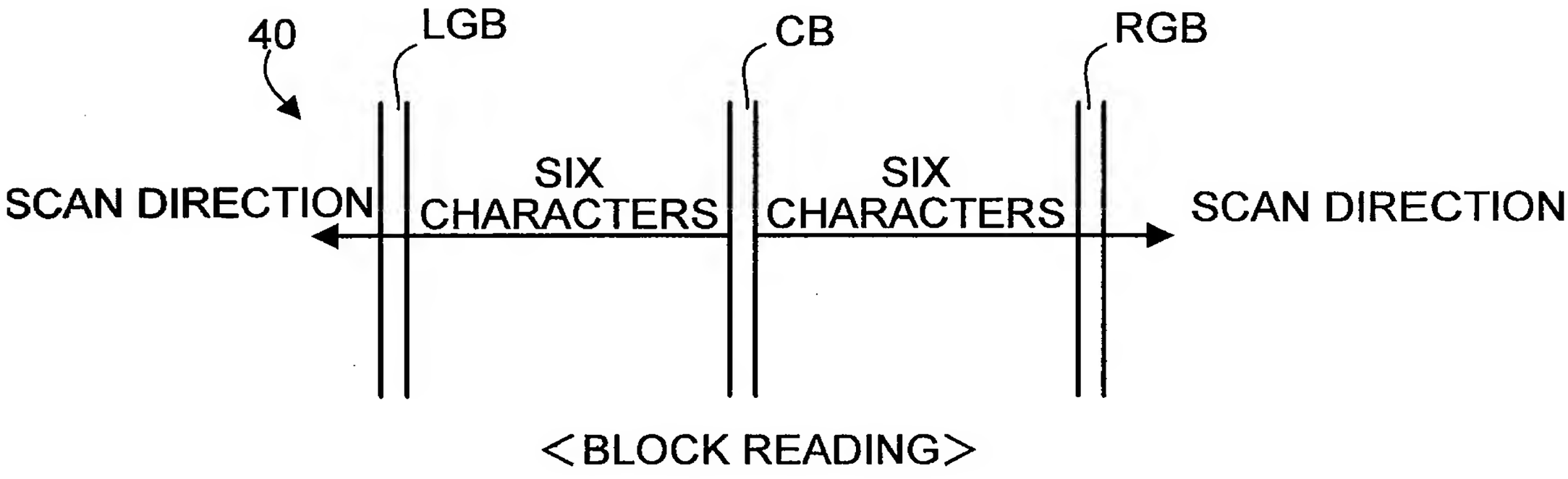

FIG.6

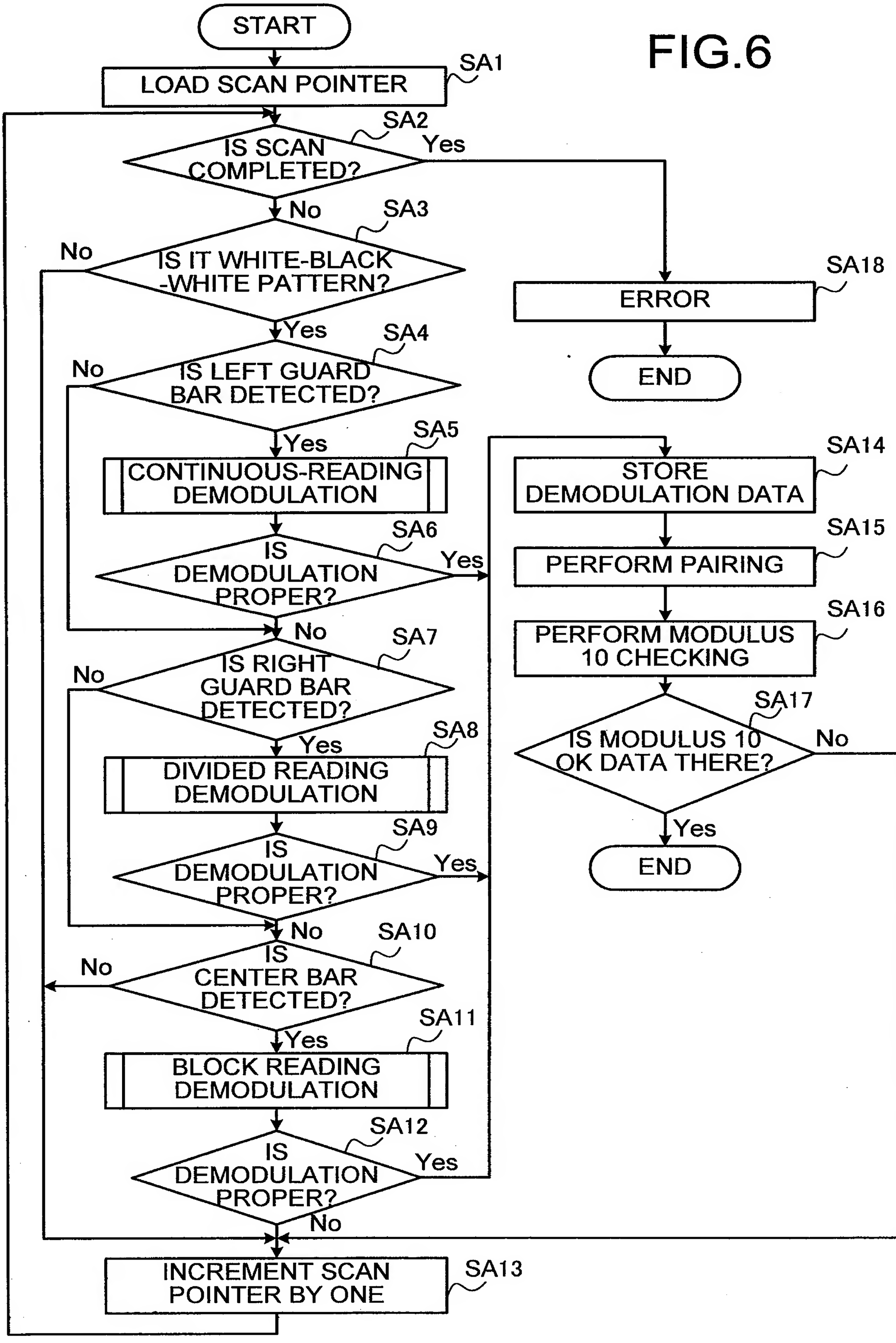
START
LOAD SCAN POINTER
SA1
IS SCAN COMPLETED?
SA2
Yes
No
IS IT WHITE-BLACK -WHITE PATTERN?
SA3
No
Yes
IS LEFT GUARD BAR DETECTED?
SA4
No
Yes
CONTINUOUS-READING DEMODULATION
SA5
IS DEMODULATION PROPER?
SA6
Yes
No
IS RIGHT GUARD BAR DETECTED?
SA7
No
Yes
DIVIDED READING DEMODULATION
SA8
IS DEMODULATION PROPER?
SA9
Yes
No
IS CENTER BAR DETECTED?
SA10
No
Yes
BLOCK READING DEMODULATION
SA11
IS DEMODULATION PROPER?
SA12
Yes
No
INCREMENT SCAN POINTER BY ONE
SA13
ERROR
SA18
END
STORE DEMODULATION DATA
SA14
PERFORM PAIRING
SA15
PERFORM MODULUS 10 CHECKING
SA16
IS MODULUS 10 OK DATA THERE?
SA17
No
Yes
END

FIG.7

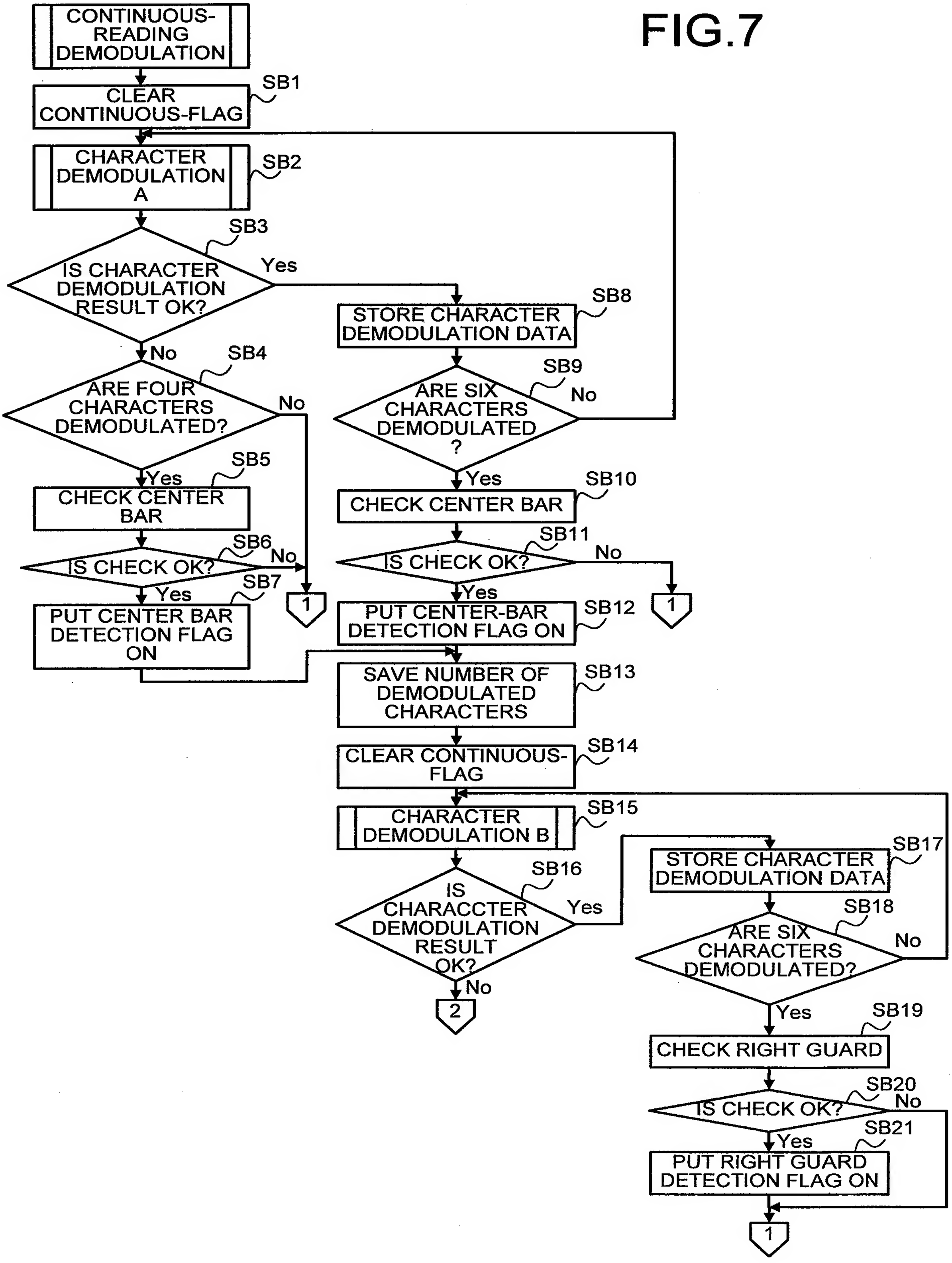
CONTINUOUS-READING DEMODULATION
CLEAR CONTINUOUS-FLAG
SB1
CHARACTER DEMODULATION A
SB2
SB3
IS CHARACTER DEMODULATION RESULT OK?
Yes
No
SB4
ARE FOUR CHARACTERS DEMODULATED?
No
Yes
SB5
CHECK CENTER BAR
SB6
IS CHECK OK?
No
Yes
SB7
PUT CENTER BAR DETECTION FLAG ON
1
STORE CHARACTER DEMODULATION DATA
SB8
SB9
ARE SIX CHARACTERS DEMODULATED ?
No
Yes
SB10
CHECK CENTER BAR
SB11
IS CHECK OK?
No
Yes
SB12
PUT CENTER-BAR DETECTION FLAG ON
1
SAVE NUMBER OF DEMODULATED CHARACTERS
SB13
CLEAR CONTINUOUS-FLAG
SB14
CHARACTER DEMODULATION B
SB15
SB16
IS CHARACCTER DEMODULATION RESULT OK?
Yes
No
2
STORE CHARACTER DEMODULATION DATA
SB17
SB18
ARE SIX CHARACTERS DEMODULATED?
No
Yes
SB19
CHECK RIGHT GUARD
SB20
IS CHECK OK?
No
Yes
SB21
PUT RIGHT GUARD DETECTION FLAG ON
1

FIG.8

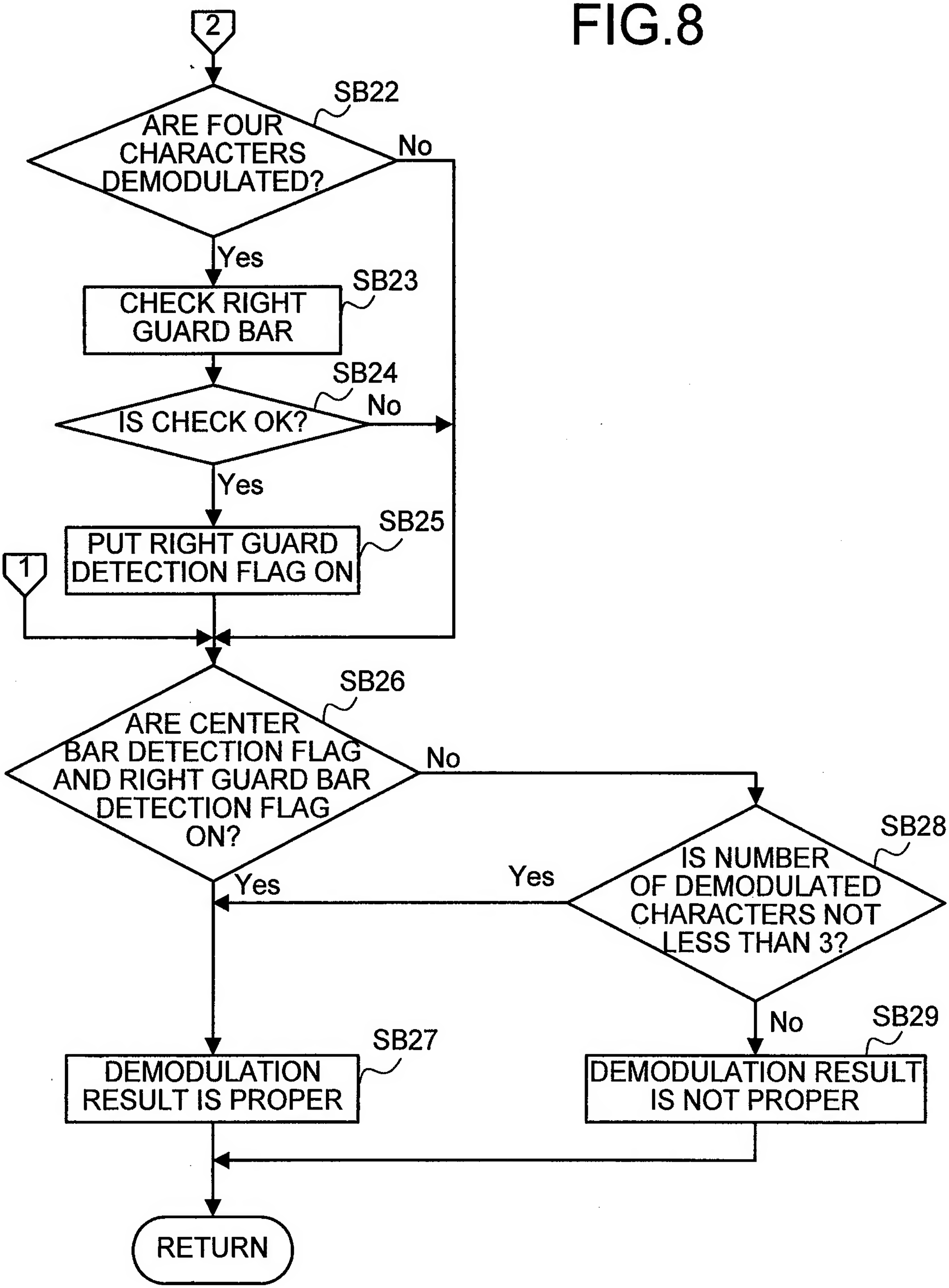
2
SB22
ARE FOUR CHARACTERS DEMODULATED?
No
Yes
SB23
CHECK RIGHT GUARD BAR
SB24
IS CHECK OK?
No
Yes
SB25
PUT RIGHT GUARD DETECTION FLAG ON
1
SB26
ARE CENTER BAR DETECTION FLAG AND RIGHT GUARD BAR DETECTION FLAG ON?
No
Yes
SB28
IS NUMBER OF DEMODULATED CHARACTERS NOT LESS THAN 3?
Yes
No
SB27
DEMODULATION RESULT IS PROPER
SB29
DEMODULATION RESULT IS NOT PROPER
RETURN

FIG.9

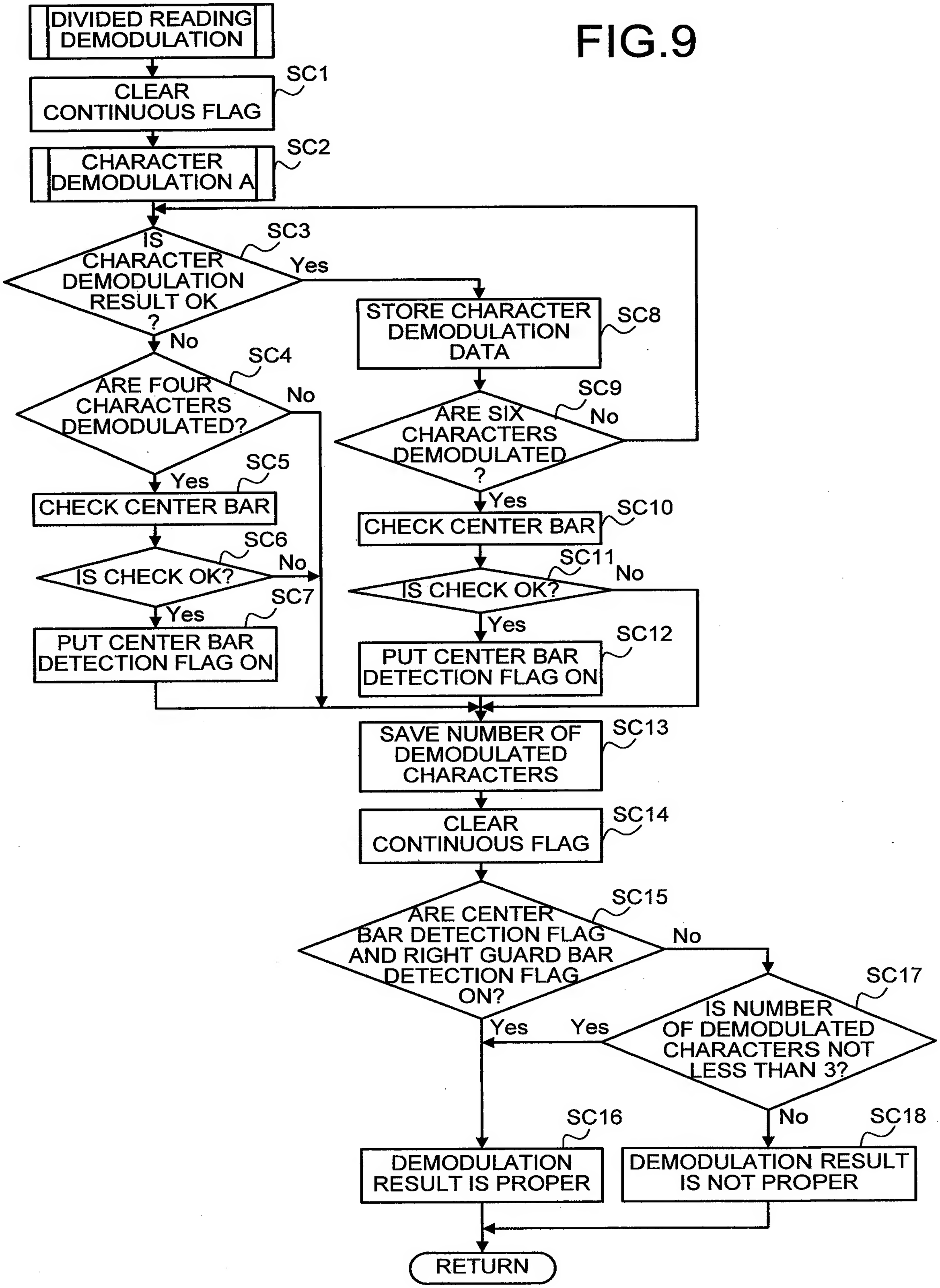
DIVIDED READING DEMODULATION
SC1
CLEAR CONTINUOUS FLAG
SC2
CHARACTER DEMODULATION A
SC3
IS CHARACTER DEMODULATION RESULT OK ?
Yes
No
SC4
ARE FOUR CHARACTERS DEMODULATED?
No
Yes
SC5
CHECK CENTER BAR
SC6
IS CHECK OK?
No
Yes
SC7
PUT CENTER BAR DETECTION FLAG ON
SC8
STORE CHARACTER DEMODULATION DATA
SC9
ARE SIX CHARACTERS DEMODULATED ?
No
Yes
SC10
CHECK CENTER BAR
SC11
IS CHECK OK?
No
Yes
SC12
PUT CENTER BAR DETECTION FLAG ON
SC13
SAVE NUMBER OF DEMODULATED CHARACTERS
SC14
CLEAR CONTINUOUS FLAG
SC15
ARE CENTER BAR DETECTION FLAG AND RIGHT GUARD BAR DETECTION FLAG ON?
No
Yes
SC17
IS NUMBER OF DEMODULATED CHARACTERS NOT LESS THAN 3?
Yes
No
SC16
DEMODULATION RESULT IS PROPER
SC18
DEMODULATION RESULT IS NOT PROPER
RETURN

FIG.10

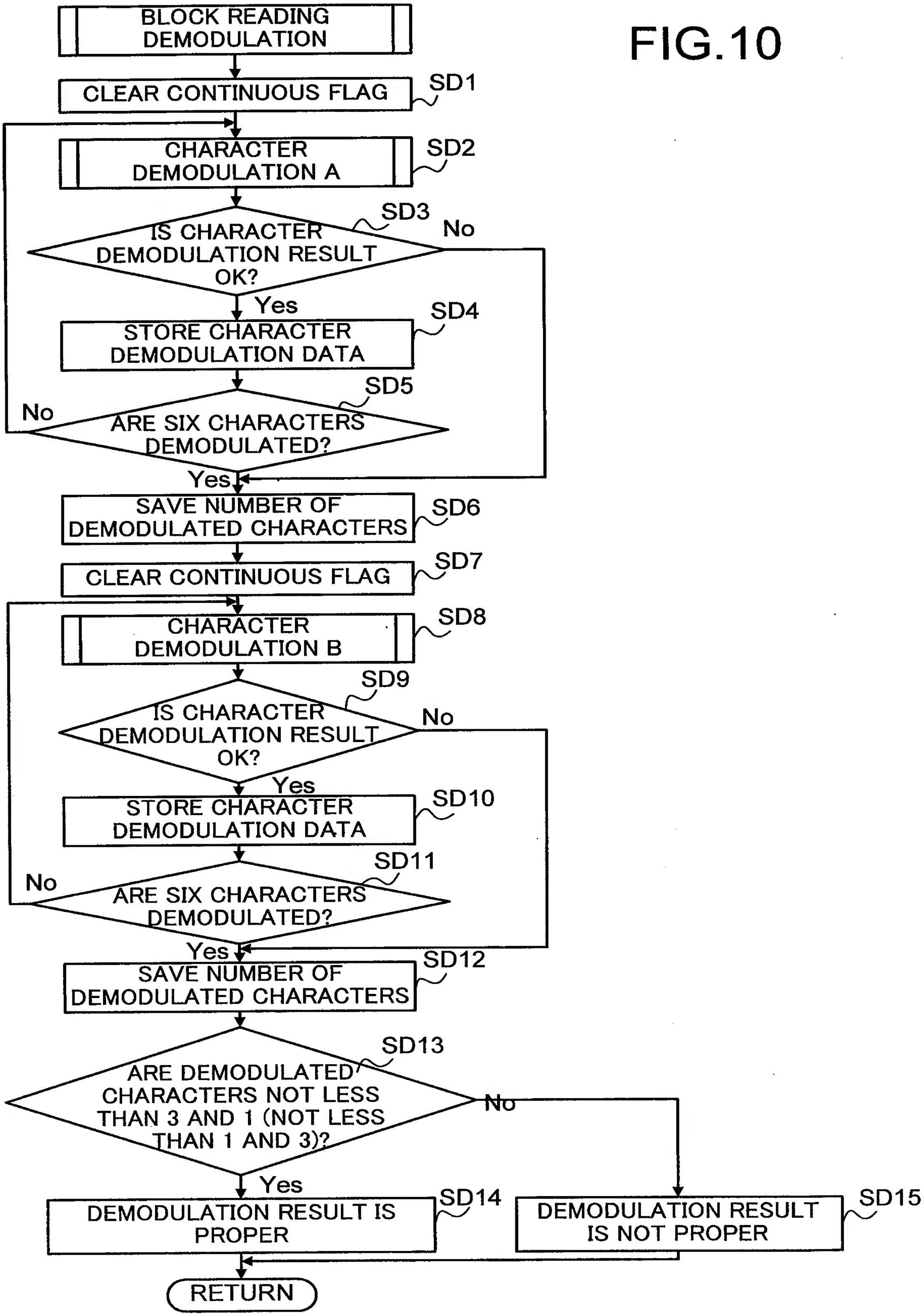
BLOCK READING DEMODULATION
CLEAR CONTINUOUS FLAG
SD1
CHARACTER DEMODULATION A
SD2
IS CHARACTER DEMODULATION RESULT OK?
SD3
No
Yes
STORE CHARACTER DEMODULATION DATA
SD4
ARE SIX CHARACTERS DEMODULATED?
SD5
No
Yes
SAVE NUMBER OF DEMODULATED CHARACTERS
SD6
CLEAR CONTINUOUS FLAG
SD7
CHARACTER DEMODULATION B
SD8
IS CHARACTER DEMODULATION RESULT OK?
SD9
No
Yes
STORE CHARACTER DEMODULATION DATA
SD10
ARE SIX CHARACTERS DEMODULATED?
SD11
No
Yes
SAVE NUMBER OF DEMODULATED CHARACTERS
SD12
ARE DEMODULATED CHARACTERS NOT LESS THAN 3 AND 1 (NOT LESS THAN 1 AND 3)?
SD13
No
Yes
DEMODULATION RESULT IS PROPER
SD14
DEMODULATION RESULT IS NOT PROPER
SD15
RETURN

FIG.11

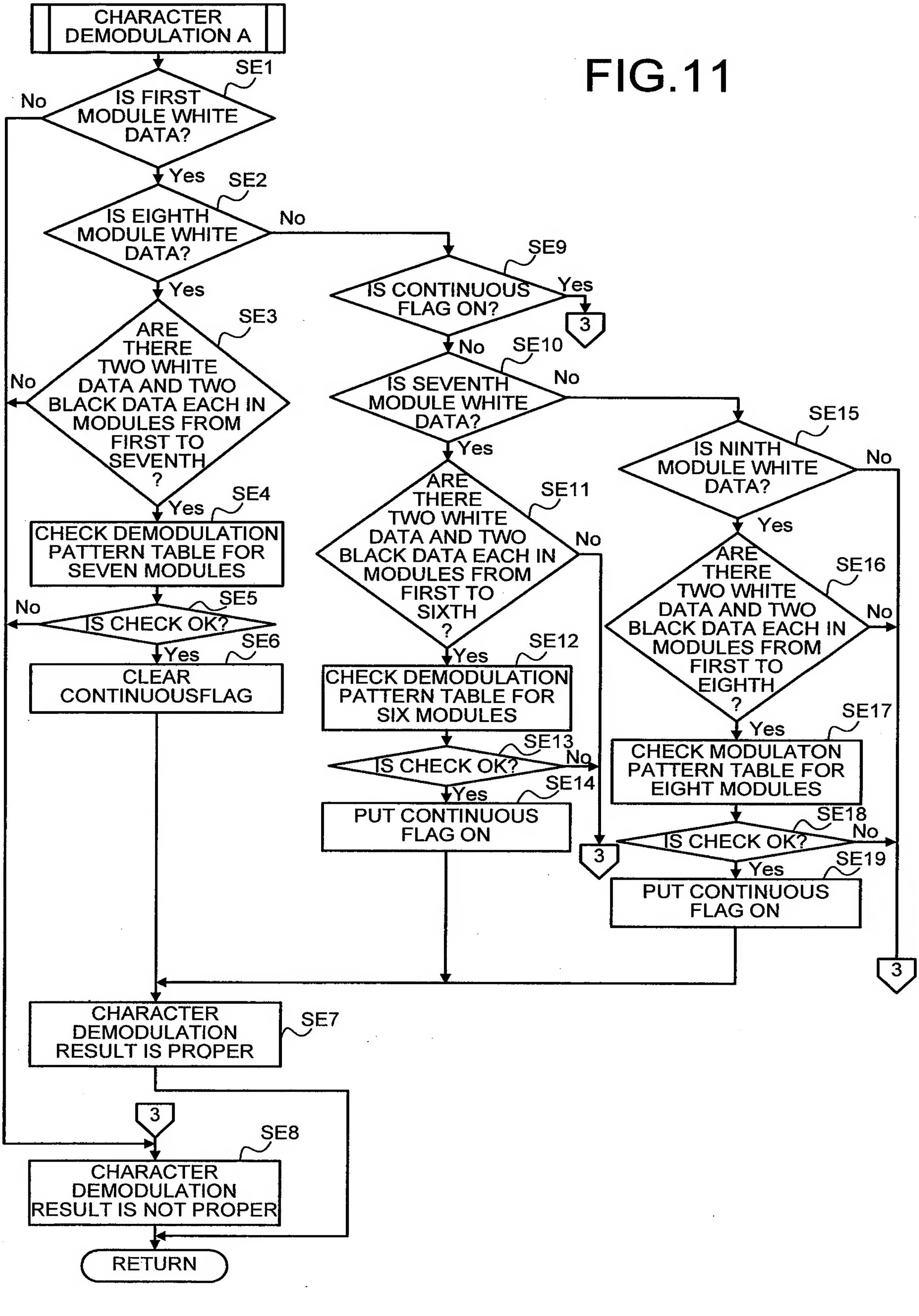
CHARACTER DEMODULATION A
SE1
IS FIRST MODULE WHITE DATA?
No
Yes
SE2
IS EIGHTH MODULE WHITE DATA?
No
Yes
SE3
ARE THERE TWO WHITE DATA AND TWO BLACK DATA EACH IN MODULES FROM FIRST TO SEVENTH ?
No
Yes
SE4
CHECK DEMODULATION PATTERN TABLE FOR SEVEN MODULES
SE5
IS CHECK OK?
No
Yes
SE6
CLEAR CONTINUOUSFLAG
SE9
IS CONTINUOUS FLAG ON?
Yes
3
No
SE10
IS SEVENTH MODULE WHITE DATA?
No
Yes
SE11
ARE THERE TWO WHITE DATA AND TWO BLACK DATA EACH IN MODULES FROM FIRST TO SIXTH ?
No
Yes
SE12
CHECK DEMODULATION PATTERN TABLE FOR SIX MODULES
SE13
IS CHECK OK?
No
Yes
SE14
PUT CONTINUOUS FLAG ON
SE15
IS NINTH MODULE WHITE DATA?
No
Yes
SE16
ARE THERE TWO WHITE DATA AND TWO BLACK DATA EACH IN MODULES FROM FIRST TO EIGHTH ?
No
Yes
SE17
CHECK MODULATON PATTERN TABLE FOR EIGHT MODULES
SE18
IS CHECK OK?
No
Yes
SE19
PUT CONTINUOUS FLAG ON
3
3
CHARACTER DEMODULATION RESULT IS PROPER
SE7
3
SE8
CHARACTER DEMODULATION RESULT IS NOT PROPER
RETURN

FIG.12

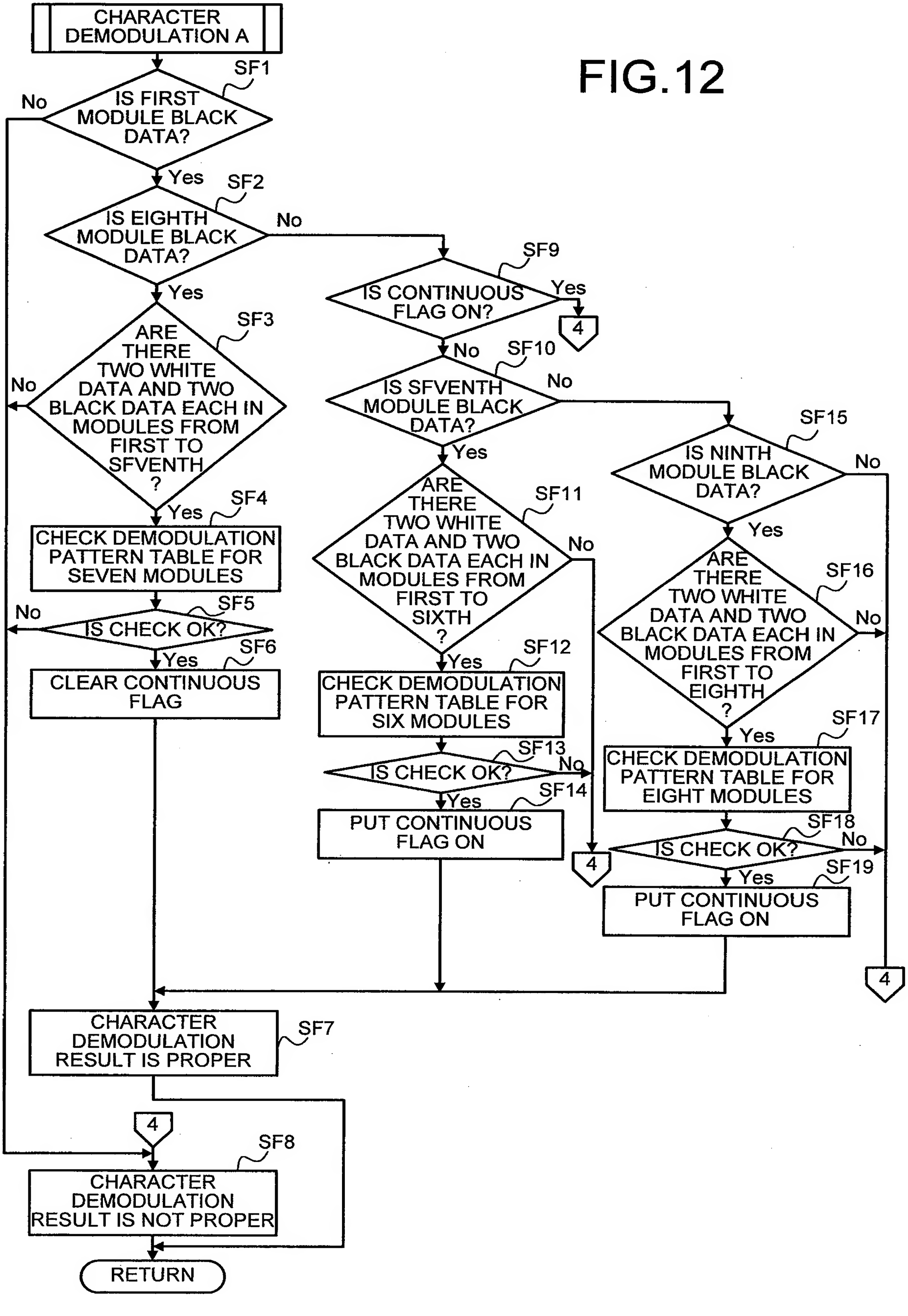
CHARACTER DEMODULATION A
SF1
IS FIRST MODULE BLACK DATA?
No
Yes
SF2
IS EIGHTH MODULE BLACK DATA?
No
Yes
SF3
ARE THERE TWO WHITE DATA AND TWO BLACK DATA EACH IN MODULES FROM FIRST TO SFVENTH ?
No
Yes
SF4
CHECK DEMODULATION PATTERN TABLE FOR SEVEN MODULES
SF5
IS CHECK OK?
No
Yes
SF6
CLEAR CONTINUOUS FLAG
SF9
IS CONTINUOUS FLAG ON?
Yes
4
No
SF10
IS SFVENTH MODULE BLACK DATA?
No
Yes
SF11
ARE THERE TWO WHITE DATA AND TWO BLACK DATA EACH IN MODULES FROM FIRST TO SIXTH ?
No
Yes
SF12
CHECK DEMODULATION PATTERN TABLE FOR SIX MODULES
SF13
IS CHECK OK?
No
Yes
SF14
PUT CONTINUOUS FLAG ON
4
SF15
IS NINTH MODULE BLACK DATA?
No
Yes
SF16
ARE THERE TWO WHITE DATA AND TWO BLACK DATA EACH IN MODULES FROM FIRST TO EIGHTH ?
No
Yes
SF17
CHECK DEMODULATION PATTERN TABLE FOR EIGHT MODULES
SF18
IS CHECK OK?
No
Yes
SF19
PUT CONTINUOUS FLAG ON
4
CHARACTER DEMODULATION RESULT IS PROPER
SF7
4
SF8
CHARACTER DEMODULATION RESULT IS NOT PROPER
RETURN

FIG.13

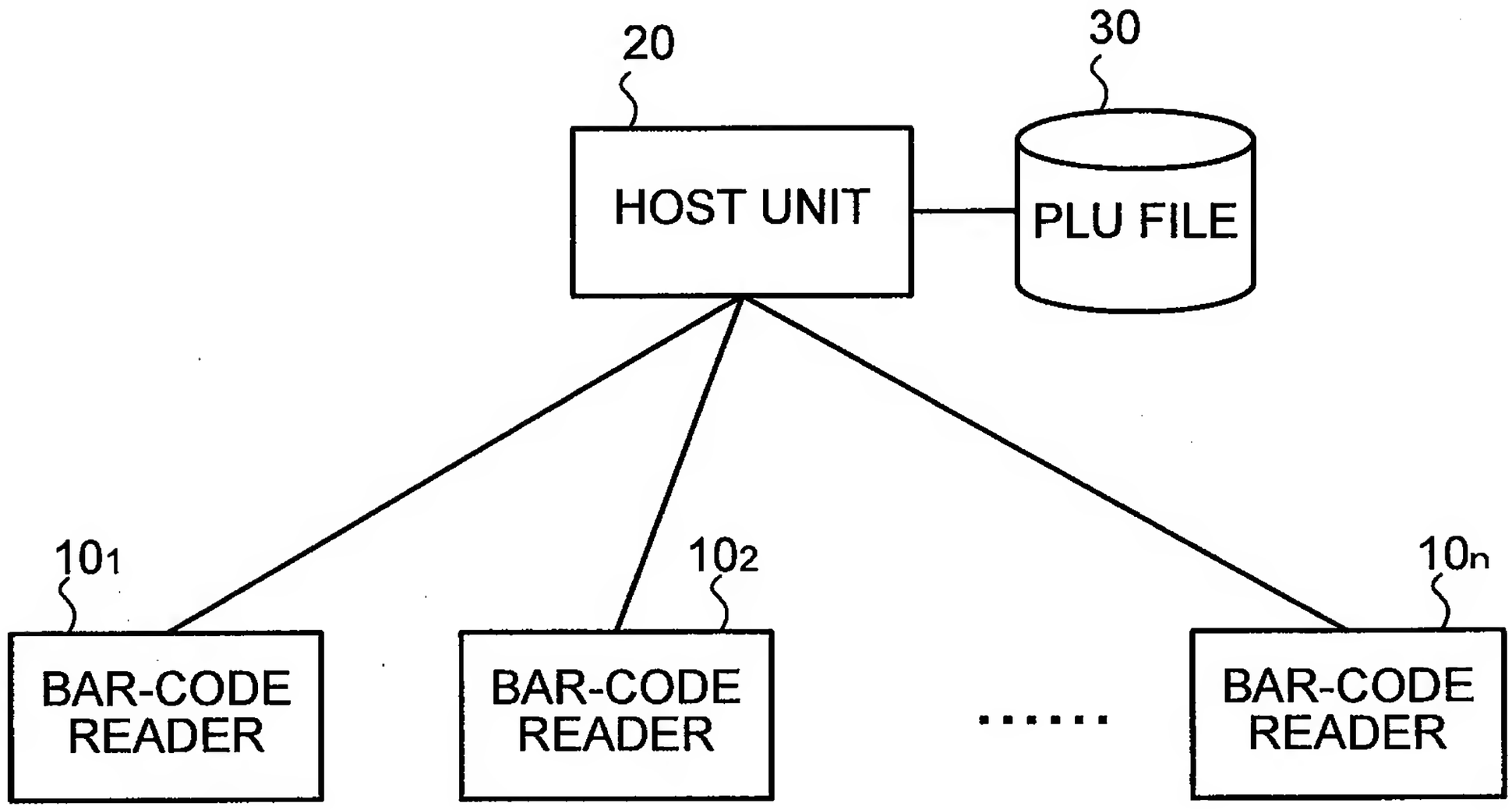
20
30
HOST UNIT
PLU FILE
10₁
10₂
10n
BAR-CODE READER
BAR-CODE READER
.....
BAR-CODE READER

FIG.14

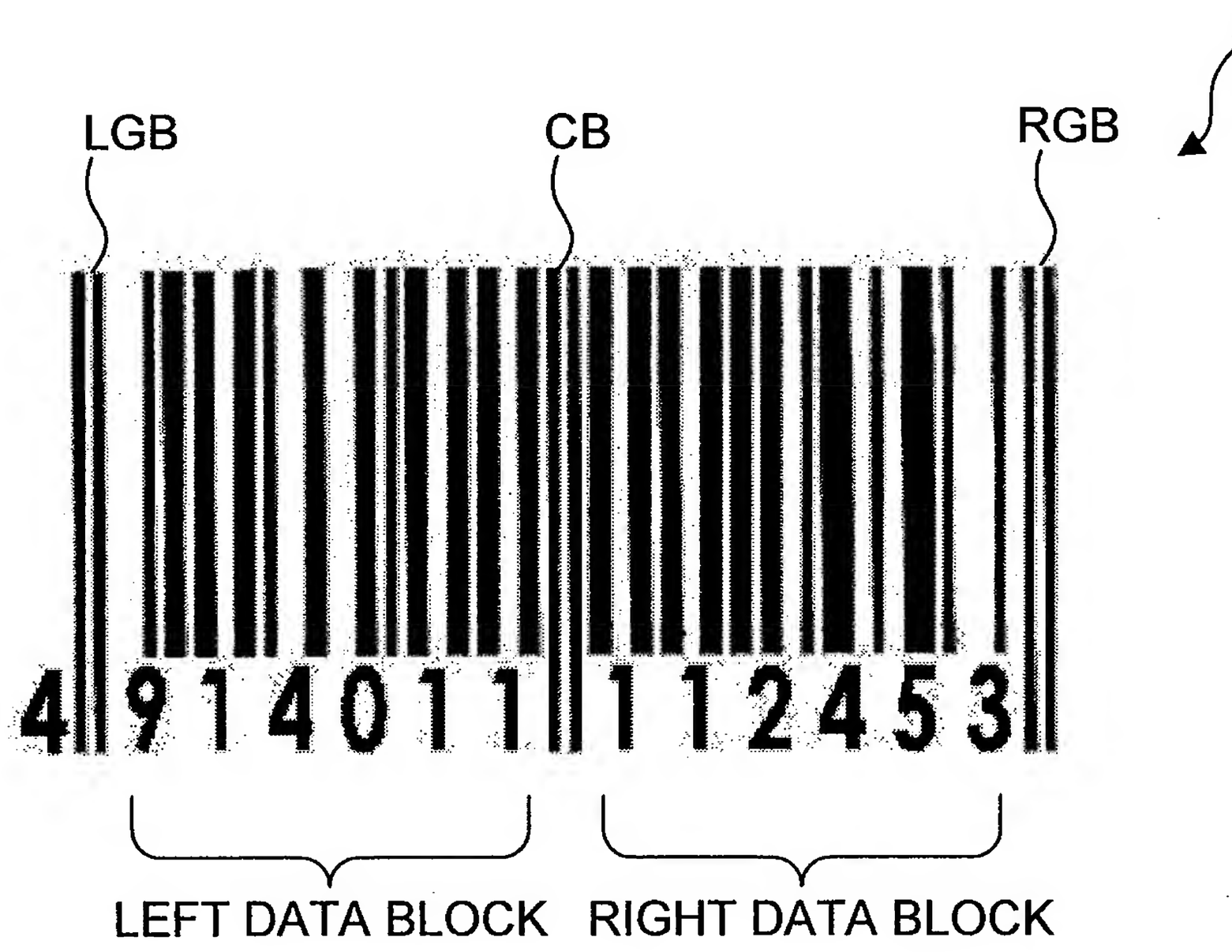
40
LGB
CB
RGB
4 9 1 4 0 1 1 1 1 2 4 5 3
LEFT DATA BLOCK
RIGHT DATA BLOCK

FIG.15

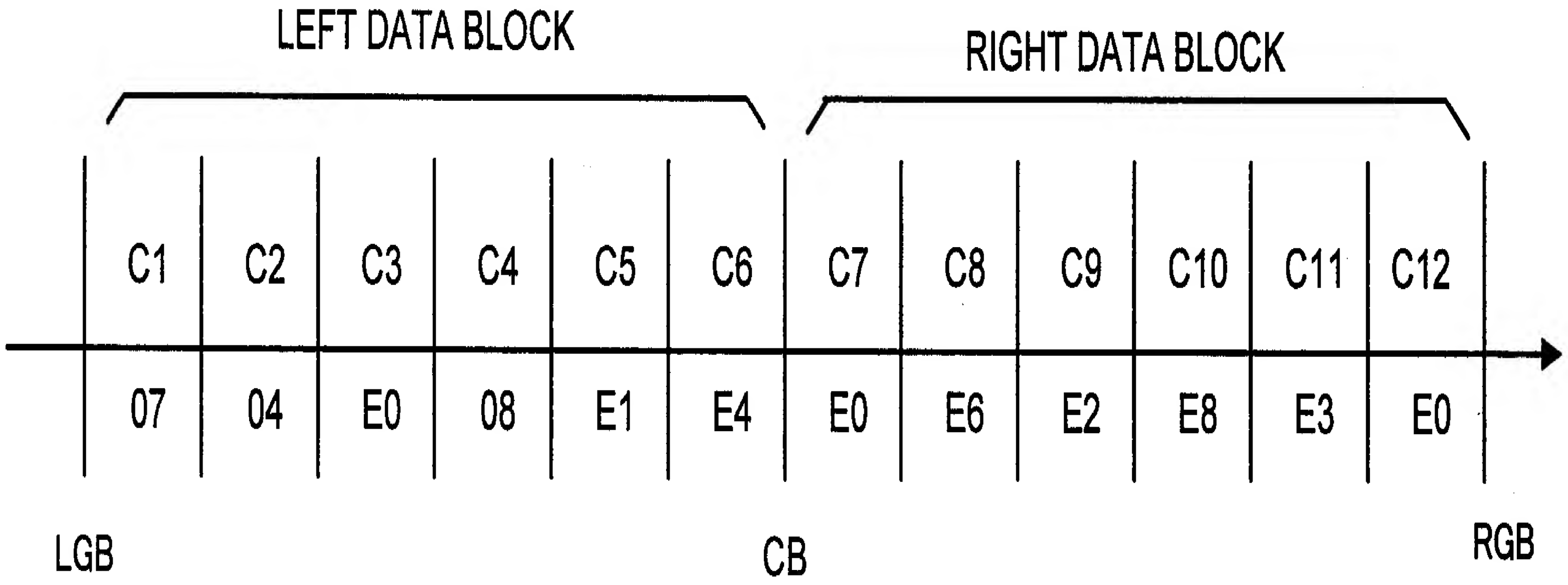
LEFT DATA BLOCK
RIGHT DATA BLOCK
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
07
04
E0
08
E1
E4
E0
E6
E2
E8
E3
E0
LGB
CB
RGB

FIG.16

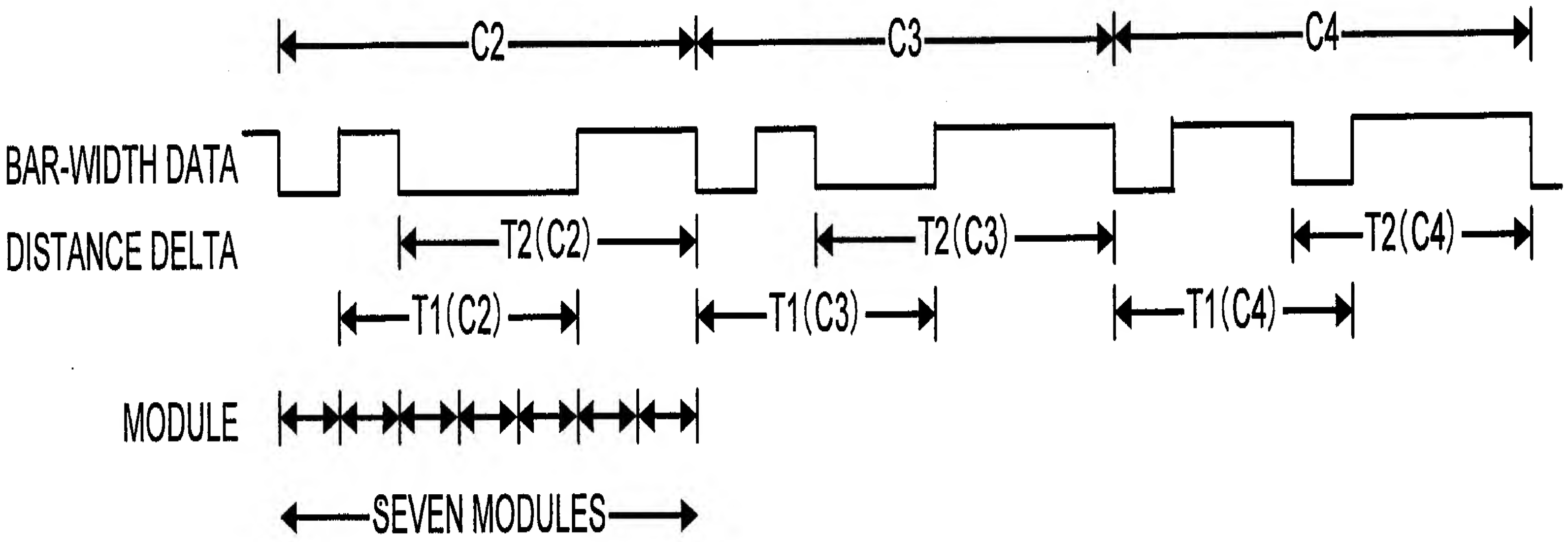
C2
C3
C4
BAR-WIDTH DATA
DISTANCE DELTA
T2(C2)
T2(C3)
T2(C4)
T1(C2)
T1(C3)
T1(C4)
MODULE
SEVEN MODULES

FIG.17

CHARACTERS	NUMBER OF MODULES						CHARACTERS	NUMBER OF MODULES					
	a	b	c	d	T1	T2		a	b	c	d	T1	T2
O—0	3	2	1	1	3	2	E—0	1	1	2	3	3	5
O—1	2	2	2	1	4	3	E—1	1	2	2	2	4	4
O—2	2	1	2	2	3	4	E—2	2	2	1	2	3	3
O—3	1	4	1	1	5	2	E—3	1	1	4	1	5	5
O—4	1	1	3	2	4	5	E—4	2	3	1	1	4	2
O—5	1	2	3	1	5	4	E—5	1	3	2	1	5	3
O—6	1	1	1	4	2	5	E—6	4	1	1	1	2	2
O—7	1	3	1	2	4	3	E—7	2	1	3	1	4	4
O—8	1	2	1	3	3	4	E—8	3	1	2	1	3	3
O—9	3	1	1	2	2	3	E—9	2	1	1	3	2	4

FIG.18

FLAG CHARACTER	LEFT-SIDE CHARACTER COMPOSITION	RIGHT-SIDE CHARACTER COMPOSITION	COMPOSITION
0	O O O O O O	E E E E E E	UPC/A
1	O O E O E E	E E E E E E	
2	O O E E O E	E E E E E E	
3	O O E E E O	E E E E E E	
4	O E O O E E	E E E E E E	
5	O E E O O E	E E E E E E	EAN13
6	O E E E O O	E E E E E E	
7	O E O E O E	E E E E E E	
8	O E O E E O	E E E E E E	
9	O E E O E O	E E E E E E	